UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

IXYS CORPORATION,

Plaintiff,

v.

ADVANCED POWER TECHNOLOGY, INC.,

Defendant.

AND RELATED COUNTERCLAIMS.

/

No. C 02-03942 MHP

CLAIM CONSTRUCTION ORDER FOR U.S. PATENTS NOS. 5,486,715, 5,801,419, AND 5,283,202

Plaintiff Ixys Corporation (Ixys) filed this action against defendant Advanced Power Technology, Inc. (APT), alleging infringement of two U.S. patents, numbered 5,486,715 (the "'715 patent") and 5,801,419 (the "'419 patent"), that it holds on an improved design for power MOSFET devices. APT has counterclaimed for infringement of its patent, numbered 5,283,202 (the "'202 patent"), on the design for transistors with lifetime control. The parties have requested that this court construe various disputed terms contained within these three patents. After having considered the parties' arguments and submissions, and for the reasons set forth below, the court rules as follows.

BACKGROUND[1]

This patent infringement case concerns the design and production of transistors and other semiconductor devices. Plaintiff Ixys Corporation and defendant Advanced Power Technology, Inc. are both semiconductor manufacturing firms that do business in Santa Clara, California. Ixys filed suit against

APT on August 15, 2002, alleging that APT was infringing two related patents detailing an improved design for "high-frequency power MOSFETs" held by Ixys. On October 1, 2002, APT counterclaimed against Ixys for infringement of a patent it held that described an improved design for producing "lifetime control" in semiconductor devices. The parties have asked this court to construe a number of disputed terms found in each of these three patents.

Although the technology involved in this case will likely be reasonably familiar to frequent students or observers of patent law (particularly in this judicial District), to say nothing of engineers or technicians in the field, a brief summary of the basic scientific background information necessary to understand the patents at issue seems appropriate. These patents involve the use of semiconductors, materials which are neither good conductors of electricity (such as metal) nor good electrical insulators (non-conductors, such as glass or wood), but instead will conduct electricity reasonably well only under certain conditions. The typical semiconductor, and the type employed here, involves a wafer of silicon (in which the atoms are arrayed in a crystalline lattice structure) that has been infused or "doped" with trace amounts of other elements in order to either add extra electrons to the lattice or to create "holes" (the absence of electrons) within the lattice where electrons can be placed. The regions of the semiconductor that have been doped to add electrons are called "N" regions, since these extra electrons represent negative charges; the regions that have been doped to add "holes" are referred to as "P" regions, since these holes represent positive charges. Where pure silicon (which is essentially glass or sand) would function as an insulator, these dopants allow the silicon wafers in which they have been implanted to operate as partial conductors of electricity.

I. The Ixys Patents

A transistor is a device that functions as an electronic—rather than a mechanical—switch. Every transistor contains three operative regions: a source, a drain, and a gate. An electrical signal flows into a transistor via the source, and is either allowed or prevented from flowing out through the drain by the "gate," which acts like its namesake; when the gate is "closed," charge cannot flow to the drain, and when the gate is "open," charge is able to flow. Transistors are built by placing three oppositely doped regions adjacent to one another (such as in a "PNP" configuration), with the middle region functioning as the "gate."

There are several different mechanisms that can be employed to "switch" the gate, reversing its polarity and allowing charge to flow, including directly applying a voltage to the gate itself. The transistors described in the '715 and '419 patents employ a different, well-known method to control the gate: they utilize a strip of polysilicon and a strip of metal to create an electric field over the gate and switch the gate on or off by modulating this field. This type of transistor is known generally as a "field effect transistor," or "FET;" the particular materials at use here classify this device as a "metal oxide semiconductor FET," or "MOSFET."

The word "transistor" usually conjures up an image of the millions of microscopic devices used in every square inch of computer chips through which flow only microscopic amounts of current. However, there is a subclass of MOSFETs known as "power MOSFETs" that are used to switch and control large amounts current in order to power and operate large mechanical devices, such as motors, computers, or medical devices. At issue in this case are "high-frequency power MOSFETs," which, as their name would indicate, are intended to manage large currents at high frequencies. The improvement over prior art that forms the crux of Ixys' patents is the addition of overlapping metallic layers, the first of which is deposited on top of the gate polysilicon and strengthens the field used to operate the gate, and the second of which forms two "buses" through which current can flow to the source and to the gate polysilicon.

Transistor fabrication involves the repeated deposition of one layer of material (a semiconductor, insulator, or metallic conductor) upon another according to a pre-selected pattern. There are several methods that are commonly utilized to define the locations in which a particular layer will be applied. Transistor manufacturers may rely upon the natural geometry (the high and low points) of the transistor layers that already exist in depositing a subsequent layer only in locations that are exposed in some particular manner. An alternative method is "mask photo-lithography," a process that involves first depositing a layer of material, followed by a layer of a photo-sensitive compound, and then removing unwanted sections by exposing them to light while shielding desired areas with a "mask" that has been patterned according to the design specifications.

II. The APT Patent

APT's '202 patent employs the same basic semiconductor technology in a different manner and for a different purpose. APT's invention principally concerns the technology for manufacturing diodes, semiconductor devices formed by placing two (instead of three) doped regions end-to-end, such as in a "PN" configuration. A diode functions as a one-way current valve, allowing charge to flow in one direction but not in the reverse direction. Diodes are characterized with respect to their "lifetimes," the amount of time required for a particular diode to reverse polarity (when the current applied to it is reversed) and transition from permitting current flow to blocking current flow.

In its patent at issue here, APT teaches a design for a diode that uses deposits of a "transition" metal (such as platinum or gold) to shorten the diode's lifetime and thus enhance its performance. APT's improvement over prior art is the non-uniform distribution according to which it deposits this metal within the diode substrate: by placing a larger proportion of the metal near the surface of the diode, in proximity with the "junction" between the P and N-doped regions, APT proposes to effect substantial control over the diode's lifetime without creating an unmanageable amount of "leakage current," current that is able to flow in the opposite direction from what the diode is intended to permit.

LEGAL STANDARD

Under Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed. Cir. 1995), affirmed 116 S. Ct. 1384 (1996), the court "has the power and obligation to construe as a matter of law the meaning of language used in the patent claim." The meaning of claims is ascertained principally through consideration of three sources: the claim language, the patent specification, and the prosecution history. See Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996). In construing the meaning of claim language, the court should look first at the claims themselves, then use the specifications to aid in defining the terms used in the claims, and finally, turn to the prosecution history if necessary and if in evidence. Id. at 1582-83.

Unless claim terms are given a different meaning by the patentee, patent language is understood to convey its ordinary meaning to one skilled in the art. Southwall, 54 F.2d at 1578 (citing Intellical, Inc. v.

Phonometrics, Inc., 952 F.2d 1384, 1387 (Fed. Cir. 1992)). Courts are to construe disputed claim language according to "an objective test of what one of ordinary skill in the art at the time of the invention would have understood the term to mean." Markman, 52 F.3d at 986. If the claim language is "clear on its face," then the court's "consideration of the rest of the intrinsic evidence is restricted to determining if a deviation from the clear language of the claims is specified." Interactive Gift Exp., Inc. v. Compuserve Inc., 256 F.3d 1323, 1331 (Fed. Cir. 2001). Courts are instructed to look to the specifications to clarify ambiguous claim terms, but must avoid reading "limitations appearing in the specification ... into [the] claims." Intervet Am., Inc. v. Kee-Vet Lab., Inc., 887 F.2d 1050, 1053 (Fed. Cir.1989).

Ordinarily, the intrinsic evidence found within the claim language, specifications, and prosecution history should be sufficient to resolve any ambiguities and determine the meaning of the claims. Vitronics, 90 F.3d at 1583. Only when it is not may the court employ extrinsic evidence, and then only to aid the court in "coming to the proper understanding of the claims" and the technology involved. Id. at 1584. The court may consider extrinsic evidence only to the extent it helps illuminate the language of the patent documents. Markman, 52 F.3d at 979-81. "The district court's claim construction, enlightened by such extrinsic evidence as may be helpful, is still based upon the patent and prosecution history." Id. at 981. Extrinsic evidence may not be used to vary or contradict the claim language. Id. Expert testimony is to be eschewed and used only as a last resort. Vitronics, 90 F.3d at 1584-85. However, the Federal Circuit in Vitronics did show a clear preference for some types of documentary extrinsic evidence, such as dictionaries and prior art documents, when used properly by the court to illuminate how a person skilled in the art would interpret particular ambiguous terms. Id. at 1585.

DISCUSSION

The parties have requested that this court construe a number of claim terms taken from all three patents. Each term is considered in turn below.

I. The Ixys Patents (The '715 and '419 Patents)

A. "A high-frequency power MOSFET device" ('715 patent, claim 23)

Both parties agree generally that a high-frequency device in this context is one that operates at between 1 Mz and 900 Mz. However, the parties disagree about what it means for a device to "operate." Defendant claims that the word operate is itself ambiguous and must therefore be defined with respect to extrinsic evidence, namely the declaration of Douglas Pike, while plaintiffs argue that it would contravene Vitronics either to engage in the construction of specification language (rather than claim language) or to employ extrinsic evidence where the meaning of a term is clear from the language and specifications of the claim itself. Vitronics, 90 F.3d at 1583.

This court is mindful of the fact that it must interpret only claim terms, not specification language, and of the fact that it must not employ extrinsic evidence (particularly expert testimony) unless language of the claims and specifications do not fully answer the questions at hand. Vitronics, 90 F.3d at 1584-85. At the same time, it would be nonsensical, not to mention hardly efficacious, for this court to employ a term that was itself materially ambiguous in construing claim language. Yet "operate" is not a particularly unclear term, even in this context, and certainly not to the degree defendant suggests. A device that "operates" in a certain frequency range is one that "functions properly" or "functions as intended" within that range, with all of the attendant limitations implied by that language. This court is reluctant to apply defendant's particularized limitation of "capable of delivering at least a 50% duty cycle" where that language may be both under- and over-inclusive of a device's "operation." The court thus adopts plaintiff's construction, minus the qualifier "about," which appears nowhere within the specification. The court construes this claim to mean: **"A power MOSFET device which operates between 1 Mz and 900 Mz."**

B. "A plurality of active MOS regions within a semiconductor substrate" ('715 patent, claim 1)

The parties agree that this language should be construed to mean "At least two active MOS regions (construed elsewhere) within a common semiconductor substrate;" defendant argues that this court should understand this language to also require that the active regions be "separate." At the outset, it is not entirely clear what APT means by the word "separate." At some points, APT appears to argue that the "plurality" of regions must be "distinct" or "distinguishable" from one another. APT Opp. Br., at 5. On the other

hand, Ixys suggests (with a greater degree of clarity than APT itself) that APT is instead advancing a limiting construction that the regions must not be "connected." Ixys Reply Br., at 3.

Of these two options, the former limitation is part and parcel of the phrase "at least two." A substrate cannot be said to contain "at least two" active regions if those regions cannot be distinguished from one another, namely if it is impossible to identify a point at which one region exists, and the other does not. The latter option is foreclosed by the specification, which states that "The embodiments shown may comprise, for example, cells which are all connected in parallel." '715 patent, 7:53-56. A claim construction that would not cover a preferred embodiment in the specification "is rarely, if ever, correct and would require highly persuasive evidentiary support." Vitronics, 90 F.3d at 1583. The language of the second half of this claim—"each of said active MOS regions having a source region, channel region, and drain region"—is not to the contrary, and does not provide near the evidentiary support necessary to overcome the Vitronics presumption. '715 patent, 7:63-65. Regardless of whether this means that each active region must have *its own* source, channel, and drain regions, or whether regions may share a source or drain,[2] the active regions may nevertheless be connected in some manner, such as through a bus.

The court has not been asked to construe the phrase "each of said active MOS regions having a source region, channel region, and drain region," and so it will not pass upon the question described above regarding whether multiple active regions may share a source, drain, or channel. It is worth noting only that "multiple" active regions cannot share a source, channel, *and* drain, since the active regions would cease to be in any way distinct or distinguishable, and thus no longer constitute "more than one" region. Since the language of the claim and specifications are sufficiently clear on these points, the court need not reference any extrinsic evidence.

The court construes this claim language to mean: **"At least two distinguishable, active MOS regions within a semiconductor substrate."**

C. "On and [in] contact with" ('715 patent, claim 1; '419 patent, claim 1).

Ixys and APT agree that the definition of this claim term should begin with the sentence "In a layered device formed on a substrate, above and touching or in immediate proximity to." While Ixys' construction ends there, APT inexplicably urges this court to add that "On or in contact may impose

different requirements, depending on the types of layers involved and how the layers interact." APT is surely aware that claim language is construed within the context of the claims in which it arises, and hence that the same words may, in some limited cases, take on different meanings when applied to different technologies or materials in different claims. Here, however, the court is asked to interpret the language "On and [in] contact with" in the context of only two claims, both of which reference "an insulating layer" in contact with "said first metallization layer." Whatever "different requirements" APT may envision, they are certainly not relevant here.

According to the parties' agreement on the first part of the definition for this term, the court construes this claim language to mean: **"In a layered device formed on a substrate, above and touching or in immediate proximity to."**

D. "Overlying" ('715 patent, claims 1 and 23; '419 patent, claims 1 and 11)

The parties' contentions regarding this claim language mirror their arguments over "on and in contact with" above. However, "overlying" is used in four different claims in two patents and in relation to at least three different pairings of materials: aluminum is overlying polysilicon in claims 1 and 23 of the '715 patent and claim 11 of the '419 patent, while a metallization layer is overlying an insulating layer in claim 1 of the '419 patent and polysilicon is overlying a semiconductor substrate in claim 1 of the '715 patent. Although APT proposes only the vague sentence described above by way of addendum to Ixys' proffered construction, its brief seems to suggest that this court read into the claim the requirement that "overlying" require electrical contact when used to reference certain pairings of materials.

Not only does the claim language itself not hint at the necessity of reading in such limitations, the specifications provide no further support for APT's assertions. The sections APT cites do not themselves require such connection. See '715 patent, 5:66-6:11. Even if the specifications had indicated the necessity of electrical contact between polysilicon and the first metallization layer, "[a]bsent a clear disclaimer of particular subject matter, the fact that the inventor anticipated that the invention may be used in a particular manner does not limit the scope to that narrow context." Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc., 334 F.3d 1294, 1301 (Fed. Cir. 2003).

The court construes this claim language (in all locations) to mean: **"In a layered device formed on a substrate, a relationship between first and second layers wherein the second layer is above or over the first layer."**

E. "A first metallization layer comprising aluminum having portion overlying said polysilicon layer" ('715 patent, claim 1)

"A first metallization layer comprising aluminum having a portion overlying a portion of said polysilicon layer" ('715 patent, claim 23; '419 patent, claim 11)

The construction of these claim terms involves the necessary resolution of several issues, each of which are considered in turn below.

1. "Comprising aluminum"

The parties agree that an element "comprising aluminum" includes some amount of aluminum but may additionally include other materials. Genentech, Inc. v. Chiron Corp., 112 F.3d 495, 501 (Fed. Cir. 1997). APT argues further that the aluminum must be in electrical contact with the layer of polysilicon. However, despite noting one section of the specifications that describe an embodiment of the invention that involves electrical contact between the first metallization layer and the polysilicon, APT cites to no language within the claim itself that could reasonably be understood to require such contact.[3] The Federal Circuit has "cautioned against limiting the claimed invention to preferred embodiments or specific examples in the specification." Teleflex, Inc. v. Ficosa North America Corp., 299 F.3d 1313, 1328 (Fed. Cir. 2002).

2. Whether the aluminum must overly the entirety of the polysilicon layer, and whether the entirety of aluminum may overly polysilicon

The parties disagree on two issues relating to Ixys' use of the word "portion" in two places within this claim language. The first question is whether, in the context of the language found in claim 1 of the '715 patent (the first phrase listed under "E." above), the aluminum layer must *completely cover* the polysilicon layer, or whether it may only overlay *a portion* of that layer. APT constructs a compelling linguistic argument that this court must read a meaningful difference into the fact that Ixys used the phrase "overlying said polysilicon layer" in claim 1 of the '715 patent and the phrase "overlying a portion of said polysilicon

layer" in claim23 of that patent and claim 11 of the '419 patent. In the course of construing claims, a court must endeavor to give meaning to every word of the claim language. See, e.g., Apple Computer, Inc. v. Articulate Systems, Inc., 234 F.3d 14, 25 (Fed. Cir. 2000); Harris Corp. v. Ixys Corp., 114 F.3rd 1149, 1152 (Fed. Cir. 1997) (holding that a construction that effectively rendered certain terms of a claim irrelevant "would contribute nothing but meaningless verbiage to the definition of the claimed invention" and is therefore disfavored). APT therefore urges this court to construe the "overlying said polysilicon layer" to mean that the metallization must overly the *entire* layer, in order to give meaning to the phrase "overlying a portion" that appears in later claim language.

Ixys counters by pointing to Figure 2B of its patent, which it says describes a preferred embodiment of the invention, and which distinctly shows a metallization layer that covers some, but not all, of the polysilicon. '715 patent, Fig. 2B. A claim construction that would not cover a preferred embodiment in the specification "is rarely, if ever, correct and would require highly persuasive evidentiary support." Vitronics, 90 F.3d at 1583. APT argues that Claim 1 does not reference Figure 2B, but only Figure 2A, and that Figure 2B must be therefore linked to some other claim language, such as Claim 23. Yet this argument is belied by the language of the specifications: "FIG. 2B is a top view showing an interconnections [sic] **120** for the improved device of FIG. 2A." '715 patent, 5:66-6:2. Although this court is extremely reluctant to adopt a construction that effectively renders the second "portion" meaningless, APT's showing does not constitute the necessary "highly persuasive evidentiary support" required by Vitronics to overcome the presumption created by the preferred embodiment.

A similar pattern of argument repeats itself over the question of whether the language requiring a metallization layer "having [a] portion overlying" the polysilicon demands that *only* a portion of the metallization overly the polysilicon (in other words, that there be some of the metallization layer that does not overly the polysilicon) or whether *all* of the metallization layer may overly the polysilicon (in other words, *at least* a portion of the metallization layer must overly the polysilicon). APT points out that Ixys was well aware of how to use the phrase "at least" in this type of context; Claim 1 of the '715 patent itself contains the phrase "a source bus overlying at least said insulating layer." '715 patent, 8:8-9. This time, however, APT must contend with both Figure 2A and Figure 2B of the '715 patent, which appear to show

the entirety of the metallization layer overlying a polysilicon layer, which is to say that there is not one portion of the metallization layer that does not overly the polysilicon.

In an attempt to adduce the "highly persuasive evidentiary support" demanded by Vitronics as a necessary predicate to construing claim language away from a preferred embodiment, APT points also to Ixys' argument before the patent examiner. Under established law, there exists a "heavy presumption that claim terms carry their full ordinary and customary meaning" unless the patentee has "*expressly relinquished claim scope during prosecution*." Omega Eng'g., Inc. v. Raytek Corp., 334 F.3d 1314, 1323 (Fed. Cir. 2003) (emphasis added). APT claims that Ixys did precisely this before the patent examiner in the course of distinguishing its own invention from the prior art of Korman et al. APT argues that the patentability of Ixys' device over Korman's prior art rests upon the fact that Korman used a "selective process" to deposit metal on polysilicon, while Ixys employed a mask-patterned method in which metal was deposited "often over portions of silicon oxide [not just polysilicon], and then masked and etched to form the desired patterns." Catalano Dec. Exh. 11, at 4.

The language of Ixys' letter to the patent examiner (from which the above-quoted line is drawn) is rather convoluted, and its interpretation bears upon several related questions involved in the construction of this claim term. It is worth reproducing the passage referenced by APT in its entirety:

> Specifically, Korman et al. advocate the use of "selectively forming silicide layers only on the exposed surfaces of the polysilicon gate electrode and the source/body regions." (emphasis added) Korman et al., col. 3, lines 40-45. As previously noted, Applicant asserts such selective formation of silicide suggests away from the claimed combination with the first metallization layer comprising aluminum *having a portion overlying the polysilicon layer portion, often not a selective process*.
>
> In addition, when a metal layer other than metal silicide layer is used, Korman et al. emphasize that such metal is "deposited using a process which deposits the metal on the single crystalline or polycrystalline silicon, but not on silicon oxide," that is, a selective process. (emphasis added). Korman et al., col. 3, lines 50-55. Applicant asserts such metal layer other than metal silicide as taught by Korman et al. cannot be aluminum because the claimed metallization layer comprising aluminum *is typically deposited overlying a top surface of a semiconductor often over portions of silicon oxide*, and then masked and etched to form the desired patterns. Accordingly, Applicant asserts Korman et al. suggest away from the claimed aluminum having a portion overlying the polysilicon layer portion, which may *often be formed over silicon oxide*."

Feeman Decl. Exh. 6, at 4 (In re Application of Nathan Zommer) (italics added) (all other emphases and alterations in original). APT argues that the presence of aluminum over other parts of the substrate *in addition to the polysilicon* was precisely the "improvement" that allowed Ixys to patent its invention over

Korman's prior art; an interpretation of claim language that allowed Ixys to recapture devices in which the aluminum overlies only polysilicon would effectively return to Ixys that which it was forced to relinquish in the course of putting forth a patentable device.

What APT has put forth is a potentially persuasive case regarding invalidity, not a winning argument of claim construction. Under the *Omega Engineering* standard, the court may properly narrow claim scope only when a patentee "expressly relinquished claim scope during prosecution,"and Ixys, whatever else the above language might appear to indicate, has not done that. Omega Eng'g., 334 F.3d at 1323. Only "definitive statements" of claim scope abandonment are judicially cognizable at this stage of the proceedings, as the Federal Circuit has "declined to apply the doctrine of prosecution disclaimer where the alleged disavowal of claim scope is ambiguous." Id. at 1324.

APT's case for claim scope relinquishment is felled by the ambiguity permeating the patent amendment excerpted above. Several times within the quoted paragraphs, Nathan Zommer, the inventor of the '715 and '419 patents, suggests that the claimed invention is distinct from the prior art of Korman et. al by virtue of the fact that the first metal aluminum is deposited not just overlying polysilicon, but over silicon oxide (an insulator) as well. See Feeman Decl. Exh. 6, at 4. APT argues that these references lead ineluctably to the conclusion that the inventor had disclaimed inventions in which the first metallization layer overlay only polysilicon, and not other materials. However, each instance in which this potential limitation is described is preceded by the word "often." See id. ("Accordingly, Applicant asserts Korman et al. suggest away from the claimed aluminum having a portion overlying the polysilicon layer portion, which may *often be formed over silicon oxide*."). This language simply does not constitute an "ambiguous" and "express" relinquishing of claim scope; the presence of the hedging term "often" lodges it firmly within a realm of ambiguity. The prosecution history lacks the definite and unmistakable abandonment of claim scope necessary to limit the full ordinary and customary meaning that claim terms would otherwise carry.

3. Mask-patterning

Much in line with the previous discussion, APT next asserts that APT's claims must be limited to cover only metallization layers that have been deposited using mask-patterning. There is no particular language within the claim itself that would indicate that mask-patterning is necessary. Rather, APT again

argues that Ixys specifically relied upon a mask-patterning process to distinguish its invention from that of Korman et al. The process used to deposit the first metallization layer is discussed twice within the portion of the amended application quoted above: "... Applicant asserts such selective formation of silicide suggests away from the claimed combination with the first metallization layer comprising aluminum having a portion overlying the polysilicon layer portion, *often not a selective process*."; "... the claimed metallization layer comprising aluminum *is typically deposited overlying a top surface of a semiconductor often over portions of silicon oxide, and then masked and etched to form the desired patterns*." Feeman Dec. Exh. 6, at 4 (underlining in original) (italics added). APT claims that this represents an "explicit relinquishment" of the claim scope at issue; Ixys argues in response that the distinction being drawn in that discussion regards aluminum vs. metal silicides as a metallization material.

The court believes that neither party is fully correct. While Ixys is certainly attempting to distinguish between Korman's use of metal silicide and its own invention's employment of aluminum, the distinction rests in part on the question of how the material was deposited; the quoted language ties the type of metal used (aluminum) to the method by which it is deposited ("masked and etched"). However, although it is certainly possible to read into this language an implied disclaimer of "selective processes" and a limitation based on mask-patterning, that disclaimer is far from explicit. See Invitrogen Corp. v. Biocrest Mfg., L.P., 327 F.3d 1364, 1367 (Fed. Cir. 2003). As with the sections referring to the placement of metal over silicon oxide in addition to polysilicon (discussed above), each mention of mask-patterning is accompanied by a linguistic hedge: "*often* not a selective process;" "*typically* deposited... and then masked and etched." Feeman Dec. Exh. 6, at 4. (emphasis added).[4]

Regardless of whether or not the Ixys patents are novel over prior art only to the extent that they require mask-patterning, the prosecution history APT cites simply does not contain a sufficiently definite and express statement of relinquished claim scope to legitimate a narrowing of those claims at this stage of the proceedings. APT has, in essence, asked this court to peek ahead and adjudicate the invalidity of these claims in the course of construing them. Although in close cases it is preferable to construe claims in such a manner as to sustain their validity, a court must not depart from a claim's otherwise appropriate meaning in an attempt to preserve it. Rhine v. Casio, Inc., 183 F.3d 1342, 1345 (Fed. Cir. 1999) ("We have

admonished against judicial rewriting of claims to preserve validity."). This court declines APT's invitation to save Ixys' claim term by such round-about means.

The court construes the claim language found in claims 1 and 23 of the '715 patent and in claim 11 of the '419 patent to mean: **"A metallization layer that contains aluminum at least a portion of which is overlying at least a portion of the polysilicon layer."**

F. "A first metallization layer comprising aluminum being defined overlying said gate region" ('419 patent, claim1)

1. APT's suggested "In electrical contact"

Mapping its argument above, APT again suggests that this court read the requirement of electrical contact between the first metallization layer and the polysilicon layer into the claim. For the reasons described above, the court declines to do so.

2. "Overlying said gate region"

Both parties agree that the "gate region" consists, in relevant part, of a polysilicon layer overlying channel regions, and possibly other areas. See '419 patent, 7:59-60; '715 patent, 5:22-26. Their disagreement stems from the question of whether this claim should be understood to require that the first metallization layer overly the channel region as part of the requirement that it overly the gate region. APT would seem to argue that the gate region consists of only that part of the polysilicon that overlies the channel region, which would imply that the first metallization layer must be found directly above the channel region in order to literally overly the gate region. See '419 patent, 7:59-60 (the gate region is "defined overlying said channel region."). However, as discussed above, the word "overlying" here does not imply exclusivity: the gate region may include portions of the gate polysilicon that overly other areas in addition to the channel region. The '715 patent, a sibling of the '419 patent, makes this point when it discusses "portions overlying the channel and field region." '715 patent, 6:10-11. The court thus finds it inappropriate to limit the gate region to that area that overlies only the channel region, and at the same time inappropriate to extend the gate region to anything covered by the polysilicon gate layer. In order to overly the gate region, the first metallization must overly either the channel region or the field region.

3. "Being Defined"

Regrettably for a court that is not as skilled in the art of MOSFET design as the parties to this case, neither side's submission regarding the terminology "being defined" is a model of clarity. In its reply brief, Ixys urges that the construction of this term retain the word "defined" because such a word is well known in the art, but does not elucidate *what the word actually means*. APT urges that "defining" a layer necessarily means using a mask, and points to several places within the specifications in which a mask is used to define a particular alignment. However, none of these specifications appear to contemplate a mask as the *sole* means of defining a layer, and Ixys notes that the specifications of the '715 patent reference a non-mask method for defining a layer. '715 patent, 5:46-49.

APT's reference to the '715 patent's prosecution history is similarly inconclusive; the submission to the examiner states that Korman et. al and Jones et. al failed to suggest "defining such first metallization layer to form a portion overlying a portion of said polysilicon layer." Catalano Dec. Exh. 11, at 5. Yet contrary to APT's assertion, the distinction is drawn not between the current invention and prior art that used a "selective process" and thus failed to "define" a layer using a mask, but between the present invention that defines a first metallization layer overlying silicon oxide *as well as* polysilicon and prior art that defines it overlying only the latter.

Divining the proper interpretation of "defining" from these legal hieroglyphs is far from a straightforward task. As best as this court can determine, to "define" a layer is to determine where that layer will be deposited—a layer may be "defined" by any number of different processes, including mask patterning or via the physical structure of the substrate itself.

4. Step-Plus-Function

In the alternative, APT suggests that Claim 1 be read as a "Step-Plus-Function" claim element under 35 U.S.C. § 112, ¶ 6. The steps-plus-function analysis "is implicated only when steps *plus function* without acts are present." O.I. Corp. v. Tekmar Co., Inc., 115 F.3d 1576, 1583 (Fed. Cir. 1997). This claim does not use the phrase "steps for;" the omission creates a strong presumption that it is not claiming a steps-plus-function element. Id. Moreover, this claim includes descriptions of acts to be taken, rather than the functioning of the invention at issue. APT is unable to point to any "function" being described within the claim language. Hence, it would be inappropriate to treat this claim as step-plus-function.

The court construes the claim language to mean: **"A metallization layer that includes aluminum, at least a portion of which is specifically deposited overlying at least a portion of the polysilicon layer directly above either the channel or field region."**

G. Claim terms including "Insulating layer":

"An insulating layer on and in contact with said first metallization layer" ('715 patent, claim 1)

"Forming an insulating layer on and in contact with said first metallization layer"('419 patent, claim 1)

"An insulating layer overlying said first metallization layer" ('715 patent, claim 23; '419 patent, claim 11)

APT urges this court to construe the claim terms at issue here to include the requirement that the insulating layer fully cover the first metallization layer and electrically insulate it from the second metallization layer. APT makes what is in essence an argument from practical function: if the first and second metallizations are to avoid shorting, there must be a layer of an electrical insulator between them, completely connecting them except for contact points. Although it seems self-evident that an "insulator" in this context must be an electrical insulator, neither the claims nor the specifications provide any indication that it must completely cover the first metal. See, e.g., '715 patent, 2:25-27. Furthermore, such an inference is not as easily drawn as APT's argument would indicate. For instance, it may well be possible to construct a MOSFET in which the second metallization itself does not completely cover the area directly above the first metallization, leaving a portion of the latter that need not be insulated from the former. Given the possibilities of such construction, and the fact that someone skilled in the art would therefore not automatically assume that the insulator *must* cover the first metallization layer, this court will not infer limitations that do not clearly exist in the specifications.

For the reasons discussed above, and in reference to the construction of the term "overlying," this court additionally declines to add the limitation that the insulating layer fully cover the first metallization layer in conjunction with that term in Claim 23 of the '715 patent or Claim 11 of the '419 patent.

The parties agree on the remaining essentials of the claim language at issue above. Since the terms are highly related, the court construes them as follows:

"A layer of electrical insulator that is on and in contact with the first metallization layer."

"Forming a layer of electrical insulator that is on and in contact with the first metallization layer."

"A layer of electrical insulator that is overlying the first metallization layer."

H. "A second metallization layer comprising a gate bus and a source bus overlying at least said insulating layer" ('715 patent, claim 1)

The construction of this phrase involves a number of separate issues, each of which are considered in turn below:

1. Whether the second metallization layer may overly only a portion of the insulating layer

The parties' first disagreement centers around the interpretation of the phrase "overlying at least said insulating layer," specifically whether the limitation that it cover "at least" the insulating layer demands that it overly the *entirety* of that layer. As a means of "clarifying" the claim language at issue, Ixys endeavors to add the disclaimer "a portion" to the claim language at issue here in order to indicate that the second metal need not overly all of the insulating layer. As it did before, APT properly notes out that Ixys has used the phrase "a portion" repeatedly throughout its claims, and so its failure to do so here must presumptively carry meaning. See, e.g., Apple Computer, 234 F.3d at 25. Indeed, the plain meaning of "at least said insulating layer" appears to correspond directly with what APT believes the lack of the phrase "a portion" implies: if the second metallization overlies "at least" the insulating layer, it must overly all of it (as well as possibly overlying other materials).

Ixys' response is to point to the specifications and argue that they display a preferred embodiment of the invention in which the second metallization layer does not overly the entirety of the insulating layer. This preferred embodiment is supposedly found in Figure 2B of the '715 patent, which displays the contact points (numbers **129**, **131**, and **135**) that electrically connect the first and second metallization layers through the insulator. See '715 patent, Figure 2B. Ixys argues that the presence of these "holes" within the insulating layer indicate that the second metallization must not be overlying the entirety of the insulation. This logical leap puzzles the court. A "hole" in the insulating layer represents (quite tautologically) an absence of insulation, and this absence is not relevant to the question of whether the second metallization overlies that insulation that does exist. By contrast, Ixys offers no evidence of a necessary "hole" in the second

metallization through which the insulating layer might "peek" through, and thereby fails to help its cause on the question at hand.

There does exist one line within the specification that appears to provide some support to Ixys' position. At one point, the specifications state that "[t]his second metallization layer is typically overlying *at least a portion* of the insulating layer...." '715 patent, 5:32-34 (emphasis added). Ixys' attempt to read this broader construction from the specification into the claim itself, while not identical to an effort to add a limitation from the specifications into the claim, seems analogous. The requirement that the second metallization overly the entire insulating layer would not exclude a preferred embodiment, and the language of the claim itself does not lack clarity. Under these circumstances, the plain language of the claim—not a sideways implication from the specifications—must control. In the face of claim language to the contrary, this court will not augment the claim scope in the manner Ixys requests.

2. "Source bus" and "Gate bus"

Although Ixys urges this court not to expound upon the meaning of the terms "source bus" and "gate bus" and their relation to one another, the claim term at issue (as well as Ixys' own proposed construction) includes both phrases. This court is loathe to leave significant disputed words within a claim element undefined, and so it will undertake to interpret the language of those terms fully.

At the outset, APT argues that the source bus and gate bus must be electrically isolated. This seems a self-evident limitation: it is common knowledge within the industry that a "bus" is an electrical conduit through which a signal or current may flow, and so an electrical interconnection between the two buses would render them effectively one entity. In addition, any individual skilled in the art would understand that a power MOSFET would not function correctly if the gate were shorted to the source; it stands to reason that any device intending to function as a MOSFET must have a gate and source that are electrically isolated.

With reference to the precise meaning of the "gate bus" itself, the specification discloses that it is in "common" with the first metallization layer (presumably meaning in electrical contact), '715 patent, 8:12-14, and that "with the improved structure, the turn-on or turn-off signal propagates from the gate pad through the gate bus portion of the second metallization through the first metallization layer...." '715 patent, 6:25-

28. Ixys urges that this court apply a more generalized interpretation, based on the common understanding of the word "bus" as "one or more conductors used for transmitting signals or power," a definition taken from the IBM Dictionary of Computing, which therefore does not speak directly to the issue of semiconductor construction at hand here.

Reliance on extrinsic evidence is improper where intrinsic evidence exists to define the term. Vitronics, 90 F.3d at 1583. Although the specification to which APT points appears less a definition of the gate bus and more a description of one embodiment of its functioning, it is well known to those skilled in the art that the function of a transistor "gate" is to switch the transistor on or off depending on the signal that it receives. The court will thus construe "gate bus" to mean generally "the conductor used to transmit an electrical signal or power to the gate." If indeed the only current that travels to the gate is the on-off signal, this definition will end up subsuming APT's proposal.

In light of this, and in the absence of any intrinsic evidence altering the meaning, the court construes "source bus" congruently as "the conductor used to transmit an electrical signal or power to the source regions."

The court construes the language at issue here to mean: **"A second metallization layer, including a source bus and a gate bus that are not in electrical contact, overlying at least the insulating layer. The source bus is a conductor used to transmit an electrical signal or power to the source regions. The gate bus is a conductor used to transmit an electrical signal or power to the gate."**

I. "A second metallization layer comprising a gate bus overlying said insulating layer" ('715 patent, claim 23; '419 patent, claim 11)

Per the definitions of terms already settled above, the court construes the claim language at issue here to mean: **"A second metallization layer which overlies at least a portion of the insulating layer and includes a gate bus. The gate bus is a conductor used to transmit an electrical signal or power to the gate."**

J. "Forming a second metallization layer overlying at least said insulating layer (including a bus line)" ('419 patent, claim 1)

There is some confusion regarding whether this court has been asked to construe only the first part of a phrase from Claim 1 of the '419 patent ("forming a second metallization layer overlying at least said

insulating layer"), a larger "portion" of that phrase ("forming a second metallization layer overlying at least said insulating layer, said second metallization layer including a bus line connected to said first metallization layer through said opening in said insulating layer"), or some hybrid that does not actually exist within the claim language ("forming a second metallization layer overlying at least said insulating layer (including a bus line)"). The court finds astounding the parties' inability to clarify precisely *what* this court is asked to adjudicate, and is bemused at APT's apparent temerity in requesting that this court evaluate language that is not directly taken from a claim. In the face of such confusion, the court will attempt to take the most responsible judicial route, a route that the parties have hardly facilitated.

Of the possible phrases listed above that this court might be asked to construe, the third of the available options is quite clearly not a proper endeavor for this court. Nonetheless, APT appears to be requesting that this court interpret the portion of this claim that includes "a bus line," and so in the interests of completeness the court will attempt just that.

As both parties note, the claim language at issue here is made up almost entirely of terms that have already been construed by this court above. APT's argument that this is a step-plus-function claim is rejected along the same lines as described above, since this claim language is part of the same claim (which includes the words "steps of" discussed previously). The court thus construes the phrase to mean: **"Forming a second metallization layer overlying at least a portion of the insulating layer that had been formed on and in contact with the first metallization layer. This second metallization layer includes a bus line, which is connected to the first metallization layer through an opening in the insulating layer.."**

K. "Low Temperature Oxide" ('715 patent, claims 4 and 26; '419 patent, claims 5 and 15)

The parties disagree regarding the appropriate level of specificity this court should adopt in construing the claim term "low temperature oxide." Ixys argues that a low temperature oxide may be any type of oxide, while APT contends that only silicon oxide (SiO_2) deposited by a particular chemical reaction is appropriate. Both parties cite to the same portion of the specifications for support: "... a low temperature oxide, gas dielectric, polyimide, or any other insulator requiring deposition, densification, or curing, at temperatures less than about 450°C is deposited over the first metallization layer." '715 patent,

5:50-52. Neither party has mentioned any other text in the specifications that bears on the question at hand.

Although this would seem to provide an adequately clear definition of "low temperature," and although the language of the specifications does not provide any indication that the "oxide" must be a particular type, APT nevertheless directs this court towards a silicon processing treatise and argues for a definition based on the descriptions in those pages. APT notes correctly that such a reference is not precisely the type of extrinsic evidence traditionally disfavored in claim construction. See Vitronics, 90 F.3d at 1583. On the contrary, "[t]he ordinary meaning of a claim term may be determined by reviewing a variety of sources, including... dictionaries and treatises...." Teleflex, 299 F.3d at 1325 (internal citations omitted). Of course, this does not alter the fact that "intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language." Vitronics, 90 F.3d at 1582.

Although this court is willing to consider APT's submission in interpreting this term, the materials APT provides do not shed further light upon, nor meaningfully confine, the claim language. In particular, none of the pages to which APT cites this court state that SiO_2 is the only low temperature oxide in use within the industry, or even attempt to limit the range of oxides that may qualify as "low temperature oxides" for the purposes of an invention such as this one. Because SiO_2 is not the only conceivable oxide to which the patent might refer, any specification of the chemical process by which that oxide may be deposited is unnecessary. The court construes the claim language at issue as follows: **"An oxide in which deposition, densification, or curing occurs at temperatures less than approximately 450ºC."**

L. "Gas dielectric" ('715 patent, claims 4 and 26; '419 patent, claims 5 and 15)

The construction of this claim conjures up a conundrum that seems relatively uncommon within patent law, although not uncommonly abstruse. Ixys has represented to the court that "gas dielectric" is in fact a misprint or typographical error, and should instead have been written as "glass dielectric" to comport with the language of the specifications of both the '715 and '419 patents. See '715 patent, 7:10-12 ("Deposit a low temperature oxide, any other desired glass dielectric..."); '419 patent, 7:1-4 (same). However, "gas dielectric" does not appear once as an isolated incidence of mistaken terminology. On the contrary, it is used twice within the claims of the '715 patent, twice within the claims of the '419 patent, and

once within the specifications of each. See '715 patent, 8:22-24, 10:24-29, 5:50-52; '419 patent, 8:9-12, 8:50-53, 5:44-47.

In light of the fact that these repeated usages of "gas" have survived numerous revisions and amendments to the patents at issue, Ixys' characterization of "gas" as simply a typographical error strains credulity. Moreover, "[i]t is important that the public be able to rely on the claims of a patent, in conjunction with the specification and file history, as indicating 'the metes and bounds of the claimed invention.'" International Visual Corp. v. Crown Metal Manufacturing Co., Inc., 991 F.2d 768, 775 (Fed. Cir. 1993) (citing London v. Carson Pirie Scott & Co., 946 F.3d 1534, 1538 (Fed. Cir. 1991). By using the word "gas" repeatedly, Ixys has created a reliance interest in the public (and particularly among potential infringers such as APT) that this court is reluctant to disturb. The court thus declines to substitute "glass" for "gas" where Ixys has failed to demonstrate the clear propriety of such a measure.

The question of the proper construction of "gas dielectric" itself nevertheless remains. Fortunately, "dielectric" is a well-known technical term: a dielectric is a non-conductor of electricity, otherwise known as an insulator. According to this understanding, the court construes the term at issue as follows: **"gas insulator."**

II. The APT Patent (The '202 Patent)

A. "A maximum dose of the selected transition metal that can be fully dissolved into the substrate at a temperature in a range between a eutectic temperature of the substrate and an annealing temperature of the substrate" (claims 1 and 2)

The parties place at issue several facets of the interpretation of this extended claim phrase. First, Ixys contends that the "dose" in question here must be determined empirically, or that it must in some manner be "measured." As a matter of pure ontology, Ixys is almost surely correct: the maximum possible dosage of a transition metal that may be dissolved is not the type of engineering question that can be determined theoretically with any meaningful precision, and so at some level experimentation is essential. However, neither party disputes that such experimentation has *already been undertaken* by others, and Ixys provides no support for its contention that such experiments need be repeated in the course of

performing the claim steps at issue here. A person skilled in the art could simply consult one of the many treatises employed by the parties. Ixys' proposed "measurement" limitation is rejected.

Second, Ixys argues that this court should assign a numerical value to the maximum upper dose in the instance where platinum is the transition metal employed. APT responds that there is nothing in the claim language that ordains platinum as the only usable metal, and this point Ixys does not appear to dispute. APT argues further that it is inappropriate to attach numerical limitations gleaned from the specifications to non-numerical claims, citing E.I. Du Pont de Nemours & Co. v. Phillips Petroleum Co., 849 F.2d 1430 (Fed. Cir. 1988), for this proposition. However, that case simply cautions against importing "a limitation read into a claim from the specification wholly apart from any need to interpret what the patentee meant by particular words or phrases in the claim." Id. at 1433. This is a well-known axiom of patent law, one which holds no proscriptive force when, as in the present case, the ambiguity of the claim language ("a maximum dose") has itself begged the numerical question. Both parties agree that since Ixys' allegedly infringing device uses only platinum that is the metal at issue here, and thus if the patent does disclose a numerical limitation on the maximum dose of platinum it would be both appropriate and expedient for this court to construe that limitation here.

The specifications for this patent state that "the substrate is doped with a transition metal in a predetermined dose less than a predetermined maximum, which is about 2 $x10^{16}$ atom/cm^2 for platinum." '202 patent, 9:5-8; see also '202 patent, 22:61-62 ("For Pt, this dose is less than 2 $x10^{16}$ atom/cm^2."). Seeking to raise this maximum threshold, APT points to the specification language that indicates that "the amount of Pt that can be dissolved into silicon is substantial (2 $x10^{21}$ atom/cm^3) which is the cause for the higher leakage current using conventional evaporation and diffusion." '202 patent, 23:2-6.

The differences between "dose" and "concentration" is one upon which the parties spend a great deal of time, and that difference seems particularly relevant and worthy of elaboration here. The "concentration" of transition metal in the silicon wafer is the number of atoms per unit volume that have been dissolved into the substrate, and is therefore expressed in units of atoms/$length^3$. The 2 $x10^{21}$ atom/cm^3 figure quoted by APT is thus an expression of concentration. The "dose" of transition metal applied in order to dope the substrate is the number of atoms per unit area that have been deposited on the surface of

the substrate (in order that they later be dissolved into the substrate), and hence is expressed in units of atoms/length^2. As it has self-identified, the 2 x10^{16} atom/cm^2 figure is a "dose."

"Doses" and "concentrations" have both a practical and a mathematical relationship. As a straightforward general rule, higher applied doses will cause higher concentrations of the transitions metals to occur within the substrate. Further, the number of particles that are eventually dissolved within the substrate must equal the number of particles initially deposited upon the surface of the substrate (assuming that few transition metal atoms are created or destroyed in the process of dissolution). In other words,

> (average concentration throughout substrate) x (volume of substrate) = (dose applied to substrate) x (surface area of substrate).

Since the volume of the substrate is essentially equal to its surface area multiplied by its "thickness" or depth (assuming no cross-sectional variation in the substrate geometry), Ixys has simplified the above equation into the form

> (average concentration throughout substrate) x (thickness of substrate) = (dose applied to substrate).

While this formula is essentially correct, it is not sufficiently precise to be entirely useful here. The entire purpose of this invention is to create a substrate with a heterogenous transition metal concentration that varies with depth. By consequence, this relationship is more usefully expressed as

> dose applied to substrate = $\int$(concentration at a given depth) x ∂(depth).

The significant fact here is that maximum concentrations at any given point can well exceed the "average concentrations" within a substrate. Without knowing whether a listed concentration is a "maximum concentration" or "average concentration," it is impossible to simply approximate dosage by multiplying concentration by thickness.

This analysis is made relevant through application to the quarrel between APT and Ixys over the maximum dosage described above. Ixys' argument is buttressed by quite explicit and categorical specification language (found within the "Summary of Invention" section) that teaches that the maximum dose for Pt is 2 x10^{16} atom/cm^2. APT argues in response that the dosage level must be higher than Ixys alleges because a 1 mm thick substrate with a concentration of 2 x10^{21} atom/cm^3 must have had an incident dosage of 2 x10^{20} atom/cm^2. However, this calculation relies on portraying 2 x10^{21} atom/cm^3 as an

average dosage throughout the substrate, not a maximum dosage at any given point. This portrayal does not withstand an examination of the specification, which describes the number in question as "the amount of Pt that *can be dissolved into silicon*," denoting a maximum possible concentration at any location. '202 patent, 23:3-4. In addition, the specification section that gives this figure references the "solid solubility of Pt in silicon" at a particular temperature range, namely the "Pt-Si eutectic temperature." '202 patent, 23:2-3. The 2 $x10^{16}$ atom/cm^2 figure, referenced explicitly in the specifications as the maximum dosage, is not controverted, and is therefore controlling.

The court construes this claim as follows: **"The upper limit to the dose of selected metal that can be fully dissolved within the semiconductor material at subsequent processing temperatures. When the selected metal is platinum, this maximum dose is about 2 $x10^{16}$ atoms/cm^2."**

B. "The maximum dose sufficient to effect lifetime control without substantially increasing leakage current of the device" (claims 1 and 2)

As a logical antecedent to interpreting the longer claim language phrase designated by the parties for construction, it is first necessary to affix a meaning to the amorphous term "substantially increasing" when used in this context. The need for contextual understanding, while always present in claim construction, is distinctly heightened in the case of language such as this which invokes an implicit comparison between a baseline level of leakage current and a quantity "substantially" above that baseline.

The specifications describe such a comparison in two places. First, they teach that "[a] dose in the range of 10^{11} to 10^{16} atoms/cm^2 of Pt is sufficient to effect lifetime control without an appreciable increase in leakage current. Higher doses can be used but will cause a higher leakage current." '202 patent, 23:9-13. This description may or may not be rephrasing "substantial" as "appreciable;" in either case, by itself it is unhelpful. However, it appears to state that a dose as large as 10^{16} atoms/cm^2 will not cause substantial leakage current.

In a second location slightly farther along, the specifications state that "Conventional evaporative deposition of e.g. 100 Å of platinum will produce an equivalent surface dose of 6.5 x 10^{16} atoms/cm^2, diffusion of which would give a leakage current of three to four orders of magnitude greater than no lifetime control. ... In contrast, implanted platinum doses in the range of 1 $x10^{13}$ to 1 x 10^{16}/cm^2 gave leakage currents in power MOSFET and IGBT-type devices that were no more than two orders of magnitude

greater compared to devices with no lifetime control." '202 patent, 23:50-61. Since the specification language referenced in the previous paragraph has already described the leakage current caused by doses up to 10^{16} atoms/cm^2 as not an "appreciable increase," the second segment of language described at the top of this paragraph indicates that leakage currents "that were no more than two orders of magnitude greater compared to devices with no lifetime control" do not constitute "substantial" increases.

This "Conventional evaporation" language described above sets forth another comparison between the quantities described in its first and second sentences. The "two orders of magnitude" (and thus not "substantial") greater leakage current caused by doses up to 10^{16} atoms/cm^2 is described "in contrast" to doses of 10^{16} atoms/cm^2 "which would give a leakage current of three to four orders of magnitude" above the baseline (set by a device without lifetime control). Putting these pieces of specification language together, the court thus finds that the specifications imply that a leakage current three to four orders of magnitude above the baseline constitutes a "substantial increase."

Having resolved the prior question regarding "substantially increasing," the remaining aspects of the construction of this claim fall into place in a relatively straightforward manner. While the claim language again does not limit the transition metal to any particular type, this case will focus around Ixys' use of platinum, and thus the court will be as specific regarding Pt as possible. The specifications analyzed above indicate that a Pt dose of 6.5 x 10^{16} atoms/cm^2 will cause a "substantial increase" in leakage current, but no portion of the specifications appears to further limit that upper threshold. The specifications contain numerous references to a dose of 10^{16} atoms/cm^2, and in particular they teach that "A dose in the range of 10^{11} to 10^{16} atoms/cm^2 of Pt is sufficient to effect lifetime control without an appreciable increase in leakage current. Higher doses can be used by will cause a higher leakage current." '202 patent, 23:9-13. The specification does not indicate that for doses above 10^{16} atoms/cm^2 the leakage will be "substantially increased;" it states only that leakage current will be "higher." Absent a more explicit limitation within the specifications, Ixys cannot demonstrate that the claims are limited to the range it has described. However, as described in section (A) above, the specifications indicate (and the claims have been construed so to reflect) that the maximum dose of Pt that can be dissolved within the substrate is 2 x 10^{16} atoms/cm^2, and

so the range of doses between 2 x 10^{16} atoms/cm^2 and 6.5 x 10^{16} atoms/cm^2 will likely be rendered functionally irrelevant for the purposes of this adjudication.

For the reasons described in part (A) above, Ixys' proposed limitation regarding the need for "measurement" is similarly rejected. Also, neither party has presented any argument to the court regarding the construction of the phrase "effect lifetime control" that is found within this claim language, and in fact APT employs that same phrase in its proposed construction. The meaning of that three-word term is apparently sufficiently well-established among those skilled in the art that this court need not clarify it further or resolve any related lingering dispute among the parties.

The court construes the claim language at issue to mean: **"The upper limit to the dose of transition metal that can be applied to the device that will be sufficient to effect lifetime control but will not cause the leakage current to increase by three orders of magnitude or more when compared with a similar device that has not had transition metal added. For Pt, this upper dose limit is between 10^{16} and 6.5 x 10^{16} atoms/cm^2."**

C. "Determining and depositing on a surface of the substrate adjacent the PN junction, a dose of the transition metal" (claim 2)

Although Ixys offers a construction of this claim as part of the Joint Claim Construction Statement, it does not appear to contest the issue in its brief. Nor does APT offer much elucidation regarding its prolix description of the technology at issue, or even suggest a particular set of words that this court should adopt as its construction of the terms in question. Fortunately, this phrase does not present any severe problems in the course of its construction—the majority of the words in use are self-evident. Most importantly, for the purposes of the disagreement that does exist, APT is correct in asserting that the limitation requiring that a dose be deposited "on a surface of the substrate" does not require that the dose remain on the surface in perpetuity. The dose is merely "deposited" on the surface (it could hardly be deposited elsewhere) and may then be diffused into the surface. This, as the court understands it, is precisely what APT's patent outlines.

Additionally, Ixys requests that this court interpret the word "adjacent the PN junction" to mean "next to the PN junction." As this court understands the technology, the PN junction in the type of diode discussed in this patent exists somewhere beneath the surface of the diode where the p-doped region meets

the n-doped region. See, e.g., Ixys' Opp. Br., at 4. It thus cannot be entirely accurate to describe a dose being deposited on the surface that is "next to" the PN junction, because the junction and the surface must be separated by some depth within the substrate. A superior construction is the preposition "near," which captures the idea that the deposition must occur within the vicinity of the junction so that it can have the desired effect without imposing a topographically illogical limitation upon the claim.

The court construes the claim language to mean: **"Ascertaining after consideration, investigation, or calculation and depositing a dose of the transition metal on a surface of the substrate near the PN junction."**

D. "First portion of the dose" (claim 1)

Per the agreement of the parties, the court construes this claim language to mean: **"That portion of the dose which is diffused first."**

E. "Second portion of the dose" (claim 1)

The parties' disagreement over this term has coalesced around the question of whether the "second portion of the dose" must be applied after the first portion, in addition to being diffused after it, or if they may be applied together. Ixys contends that the plain language of the claim itself demands that the second portion be applied after the first portion. In evaluating this claim, it is worth quoting a larger section of the claim than the parties have here put at issue in order to establish context:

> ... an improved minority carrier lifetime control process comprising...
> determining and depositing a dose of the transition metal not exceeding the maximum dose sufficient to effect lifetime control without substantially increasing leakage current of the device; and
> diffusing the metal atoms throughout the substrate at a temperature within said range, including;
> *diffusing a first portion of the dose throughout the substrate; and*
> *diffusing a second portion of the dose....*"

'202 patent, 28:56-29:5 (emphasis added). Not only does this language fail to support Ixys' position, it actually undermines it. The diffusion of the dose is explicitly described as taking place in two steps and involving a first and a second portion. But the initial deposition is mentioned only once; the process requires "determining and depositing *a dose of the transition metal*," not two doses in sequence.

The specifications trace a similar pattern. The relevant portion of the specifications, cited by both parties, teaches:

> "First, the substrate is lightly dosed with, e.g., 10^{11} Pt atoms/cm^2, and diffusing the Pt atoms throughout the device at first elevated temperature, e.g., 850º-865ºC. for one hour for a PIN. Second, an additional dose of Pt atoms is applied to a selected surface of the device and is diffused at a higher temperature, e.g., 950º-1100ºC. for 5-20 seconds (rapid thermal anneal) such that the additional dose is retained in a gradient band near the selected surface. *Preferably, the doses can be applied in a single implant or silicide formation step.*

'202 patent, 24:13-22 (emphasis added). The disclaimer in the last sentence effectively negates the full thrust of support that this section might have provided for Ixys' position, and thus the specifications do not provide sufficient justification for amending the clearer claim language.

The court construes this claim term to mean: "That portion of the dose which is diffused after the first portion."

F. "Gradient band near a selected surface of the substrate" (claim 1)

Although the parties employ slightly variant language in their proposed claim constructions, it appears that there are no material issues regarding this claim term that are in dispute. In an attempt to simply clarify and simplify parties' constructions, the court construes this claim term to mean: **"Near to a selected surface of the substrate, and distributed non-uniformly within the substrate according to depth such that the concentration of transition metal atoms within the substrate is higher at or near the surface where it was introduced and decreases as one moves away from the surface and deeper into the substrate."**

G. "The transition metal is tailored to have a relatively shallow profile compared to a completed diffusion throughout the entire substrate" (claim 7)

Ixys has revised its proposed construction of this language from Claim 7 to read: "Diffusing the transition metal atoms in the substrate in such a way that there is a higher concentration of transition metal atoms near the surface of the substrate, and a lower concentration of transition metal atoms in the substrate, than there would be with a completed diffusion 'throughout the substrate.'" Ixys' Opp. Br., at 19. APT states that it will accept Ixys' construction as long as the phrase "lower concentration" is understood to be inclusive of zero. APT's Reply Br., at 15. Ixys gives no indication that a "lower concentration" could not include zero, and indeed there is no basis for Ixys to argue such. In the context of this particular phrase of claim language, then, there appears to be no meaningful disagreement. The question of whether (in claim 7)

transition metal atoms must exist in all parts of the substrate hinges not on the comparison at issue in this claim term, but on the construction of the word "throughout" in claim 2, which is addressed below.

Since the meaning of "throughout the substrate" is disputed, whereas the meaning of the original term ("throughout the entire substrate") is not (see (H)(1), *infra*), it seems prudent to make that substitution within Ixys' proposed phrase. The court construes this claim language to mean: **"Diffusing the transition metal atoms in the substrate in such a way that there is a higher concentration of transition metal atoms near the surface of the substrate, and a lower concentration of transition metal atoms in the substrate, than there would be with a completed diffusion throughout the entire substrate [construed *infra*]."**

H. "Through," "Throughout," and "Throughout the Entire":

"Throughout the substrate" (claims 1 and 2)

"Through the substrate" (claim 3)

"Throughout the entire substrate" (claim 7)

Ixys and APT disagree as to whether the terms "through," "throughout," and "throughout the entire," which are collectively employed five times in claims 1, 2, 3, and 7 of the '202 patent, necessitate that the transition metal that is to be deposited "throughout"or "through" the substrate be diffused into the entire substrate, or merely into certain layers. The dispute over these terms stems in part from the slightly different contexts in which the words are used, and the parties make a number of different arguments specific to particular claims in particular contexts. In order to deal with these various arguments in as clear and thorough a manner as possible, the court will address each section of claim language (and the arguments accompanying it) separately.

1. "Throughout the Entire Substrate" (claim 7)

This claim term offers a useful starting point because the parties agree on its meaning. The court construes this claim language to mean: **"Through every part of the substrate."**

2. "Throughout the Substrate" (claim 1)

This phrase appears in two places within claim 1. In order to better elucidate the context in which the term is used, the entire section involving this term is reprinted here:

> diffusing the metal atoms *throughout the substrate* at a temperature within said range, including:
> diffusing a first portion of the dose *throughout the substrate*; and
> diffusing a second portion of the dose in a gradient band near a selected surface of the substrate.

'202 patent, Claim 1 (emphasis added). The claim language itself, within the context of the terms surrounding it, forms the starting point of any construction analysis and is the most important factor that a court must consider, and thus the court will address the contextual understanding of this language first. Vitronics, 90 F.3d 1582. In this claim, the language at issue appears to be establishing a comparison between two steps, and two types, of diffusion: the metal atoms are diffused through every part of the substrate in two steps, the first being a broad diffusion of atoms through every part of the substrate, and the second a more limited diffusion in just a gradient bandwidth near the substrate surface. The implicit contrast is between the "first portion" of the dose which is diffused ubiquitously, and the "second portion," the deposition of which is limited to the area near the surface of the substrate.

APT, the owner of the '202 patent, protests that the specifications and the very nature of the invention militate strongly against reaching such a conclusion and teach away from finding a requirement that transition metal pervade the entire substrate. APT points to three sections of the specifications that it claims represent preferred embodiments that do not require metal through "every part" of the substrate and thereby support its position. As this court has noted previously, it is presumptively unreasonable and improper to construe the claims in such a way that a preferred embodiment is excluded. See id. at 1582.

However, the three parts of the specifications relied upon by APT do not significantly aid its position. APT first references Figure 17, a graph of transition metal concentration vs. depth within the semiconductor for different types of dose and diffusion mechanisms. '202 patent, Figure 17. APT notes that at a certain depth (the x-axis of the chart is unmarked, and so that depth is unknown), the line graph showing the concentration of atoms intersects the x-axis (presumably implying that the concentration is zero); APT therefore concludes that the transition metal "extends only partially into the semiconductor." APT's Opening Br., at 11. However, the y-axis of this graph also lacks a label, and so there is no indication that the x-axis actually represents the point at which transition metal concentration equals zero. Rather, it may be that the graph is in some sense "normalized" based on the diffusion of the "first dose" throughout the substrate; the background concentration of transition metal is dropped from the analysis, and

the graph itself represents only the concentration due to the diffusion of the second portion above the already extant level.

APT also points to two sections within the same paragraph of the specifications. The first of these two sections is rather opaque, and as such sheds little light on the current issue. The specifications teach that "Low lifetime control doping in the bulk of the epitaxial layers combined with a higher concentration near the substrate surface adjacent the PN junction can provide the best effect." '202 patent, 24:8-12. This language does not employ the word "throughout," nor does it preclude diffusion throughout the entirety of the substrate, since the specification language does not indicate whether the substrate may be doped *only* in the epitaxial layers, or additionally elsewhere. The second of these sections essentially mirrors (in structure) the claim language described above:

> First, the substrate is lightly dosed with, e.g., 10^{11} Pt atoms/cm^2, and diffusing the Pt atoms throughout the device at first elevated temperature, e.g., 850°-865°C. for one hour for a PIN. Second, an additional dose of Pt atoms is applied to a selected surface of the device and is diffused at a higher temperature, e.g., 950°-1100°C. for 5-20 seconds (rapid thermal anneal) such that the additional dose is retained in a gradient band near the selected surface.

'202 patent, 24:13-21. Much like the claim language referenced above, this section of the specifications describes the diffusion process in two steps, the first of which spreads metal atoms "throughout" the substrate, and the second of which results in a gradient concentration near the surface. Neither of these portions of the specifications significantly bolsters APT's position.

APT's final argument with reference to the particular language in Claim 1 draws upon the fact that both parties have agreed that "throughout the entire substrate" in Claim 7 means that metal must be diffused in every part of the substrate. APT contends that adopting Ixys' position and construing "throughout" to mean "through every part of" would eviscerate any possible meaning that might be attached to the word "entire." See, e.g., Apple Computer, 234 F.3d at 25 (Fed. Cir. 2000). APT is certainly correct about this fact; however, such arguments from linguistic logic are not, by themselves, sufficient to overcome the plain language and context of the disputed claim terms themselves. Finally, Ixys notes that the plain meaning of the word "throughout" is "in, to, through, or during every part of; all through." American Heritage Dictionary of the English Language (4th ed. 2000). The dictionary definition of a word is hardly decisive in

this context, but it does serve to buttress the impression that the claims and specifications have already made.

3. "Throughout the Substrate" (claim 2)

APT offers one additional argument related to the phrase of claim 2 that describes "diffusing the metal atoms throughout the substrate at a temperature within said range." '202 patent, claim 2. Claim 7 is a dependant claim based upon claim 2 which describes "The fabrication process of claim 2 wherein the transition metal is tailored to have a relatively shallow profile compared to a completed diffusion throughout the entire substrate." '202 patent, claim 7. APT protests that if the diffusion process described in claim 2 already involves spreading transition metal atoms throughout the entirety of the substrate, the process described in claim 7 (which is dependant upon claim 2) must contain all the limitations of the claim 2 process, and thus cannot simultaneously include metal diffused throughout the substrate *and* "have a relatively shallow profile compared to a completed diffusion throughout the entire substrate."

If a "shallow profile" literally meant that there could be no transition metal atoms deposited below a certain (shallow) depth, APT would seem correct in noting this inconsistency. However, the parties have already agreed that a "shallow profile compared to a completed diffusion throughout the entire substrate" must be understood to mean that "there is a higher concentration of transition metal atoms near the surface of the substrate, and a lower concentration of transition metal atoms in the substrate, than there would be with a completed diffusion throughout the entire substrate." See (G), supra. It is entirely possible to comply with both requirements simultaneously: a substrate would contain metal throughout every part, but a lower concentration would be present at greater depths (and a higher concentration present at shallower depths) than would exist after a "completed diffusion" (namely one in which no metal is purposefully retained near the surface in a gradient band). APT's contentions on these grounds thus lack merit.

4. "Through the Substrate" (claim 3)

APT's final argument seizes upon the language of dependant claim 3, which directs one skilled in the art to diffuse the transition metal "through the substrate" using a rapid thermal anneal process. APT notes correctly that the only discussion of the "thermal anneal" process within the specifications comes in reference to the deposition of the "second portion" of the transition metal dose. There, the specifications

state that the second portion of the dose is diffused according to "(rapid thermal anneal) such that the additional dose is retained in a gradient band near the selected surface." '202 patent, 24:19-21. This conclusive linkage between a "thermal anneal" process and the diffusion of atoms only within a thin band near the surface of the substrate provides a strong indication that the word "through" in this claim cannot mean "throughout the entirety" of the substrate.[5]

APT's reasonably strong showing that "through" should be construed in such a way that it does not require that metal be diffused throughout the entirety of the substrate creates additional problems in this analysis. Claim 3 is a dependant claim of claim 2 that describes a specific process for diffusing "the selected transition metal," and claim 2 requires "diffusing the metal atoms throughout the substrate." If claim 2 is construed such that metal must be diffused into every part of the substrate, Claim 3 must contain the same limitation. Reciprocally, if claim 3 does not require that transition metal be diffused throughout the entire substrate, claim 2 must not either. And if the word "throughout" in claim 2 does not require diffusion throughout the entire substrate, the desire for harmony among the claims would militate against construing the term "throughout" in claim 1 to require diffusion throughout the substrate and thereby attaching to it a meaning different than the same term in claim 2.

The ties among these claims leaves this court with very little choice but to construe them all in congruent fashion, and in the face of conflicting and essentially irreconcilable implications in the claims and specifications (as well as the dictionary). Although both parties have put forth reasonable cases, it seems to the court that the preponderance of the evidence weighs in favor of attaching to "throughout" and "through" the meanings that the plain language and the structure of the claims themselves would most appear most clearly to dictate. The court construes all of the claim terms at issue here to mean: **"Throughout every part of the substrate."**

I. "Profile tailoring the concentration of transition metal atoms in the substrate relative to the surface of the substrate" (claim 2)

The construction of this claim involves a number of peculiarities, not least of all the fact that APT's explanation of profile tailoring *in the background section of its brief* provides a clearer and more obvious explication of the term than either of the parties' proposed constructions, the specifications, or the claim itself. In its opening brief, APT wrote that "[a]t least part of the platinum diffusion has a tailored profile, that

is, the concentration of platinum with respect to the substrate surface changes as a function of distance from that surface, as shown in Figure 3." APT Opening Br., at 4. This explanation comports well with an intuitive understanding of "profile tailoring," namely the structuring and adjusting of (in this case) transition metal atoms in order to achieve a particular layout or pattern. Nevertheless, since this explanation is offered only in the background section to APT's Brief, the court will turn to the claim and specifications for elucidation.[6]

Both sides agree that only one portion of the specifications discusses profile-tailoring, and even then somewhat obliquely. The specifications teach that "[t]his technique can also be used to profile-tailor the lifetime control dopant with multiple temperature cycles." '202 patent, 24:1-3. The specifications that succeed this sentence describe a process for diffusing metal atoms into the substrate in a series of steps. In particular, it discusses a particular alignment of metal atoms within the substrate: "Low lifetime control doping in the bulk of the epitaxial layers combined with a higher concentration near the substrate surface adjacent the PN junction can provide the best effect. This *doping profile* can be obtained...." '202 patent, 24:8-12. This leads to the conclusion that a "profile" is indeed a particular pattern or alignment of transition metal atoms within the substrate. Drawing upon the sentence of the specifications that mentions a technique to "profile-tailor," it would appear that "tailoring" is being used in typical fashion in this context to mean "fashioning, adapting, structuring, or adjusting for a particular purpose." This understanding is congruent with claim 7 of the '202 patent, which discusses tailoring a transition metal to have a "relatively shallow profile." '202 patent, claim 7. In that case the "profile" or pattern of metal concentrations is being adjusted in order to achieve the desired "shallow" pattern.

Strangely, both parties propose a number of limitations that do not appear to be compelled by either the claim language or the specifications. Ixys wishes to add the requirement that the profile of metal atoms must be adjusted in at least two places in the substrate based upon only a preferred embodiment which itself is explicitly non-exclusive.[7] Furthermore, there is no support whatsoever within the specifications or the claims for Ixys' assertion that a tailored profile involves metal atom concentrations that are higher in one place and lower in another than "would be achieved by a single application and diffusion of transition metal atoms at a time and temperature." Ixys' Opp. Br., at 17. Ixys attacks APT's proposed

construction because it would not exclude the possibility of a "flat profile," namely one in which the concentration of metal atoms is constant with respect to depth in the substrate. However, the only reliable indication that a "flat profile" must be excluded comes from the Background section of APT's memorandum, which describes a concentration that varies with respect to depth.

APT's proposed construction seems both under- and over-inclusive. On one hand, there is no reason to limit the claim language to a process that places metal atoms near the surface of the substrate in a gradient band; the claim language (and the specifications, which describe only briefly a preferred embodiment) is broad enough to encompass types of tailoring that might involve deposition of transition metal deep into the substrate. However, APT's language fails to capture what appears to be the nucleus of the meaning of "profile tailoring," namely that metal atoms are being deposited in certain areas or layers precisely in order to create a particular pattern or "profile."

Finally, neither side has discussed the phrase "relative to the surface of the substrate" in any real "depth." However, the use of this phrase within a semi-conductor patent (a field in which devices are created in stacked layers) and the manner in which it is employed lead the court to believe that a person skilled in the art would reasonably understand it to mean "as a function of depth."

In light of these factors, the court construes this claim term as follows: **"Fashioning or adjusting the concentration of transition metal atoms as a function of depth within the substrate in order to create a particular pattern or layout of depth-wise concentrations."**

J. "Rapid thermal anneal process" (claims 3, 4, and 5)

Much to this court's dismay, neither party has been terribly helpful with regard to the construction of this claim term. The phrase "rapid thermal anneal" appears only once within the specifications: "Second, an additional dose of Pt atoms is applied to a selected surface of the device and is diffused at a higher temperature, e.g., 950°-1100°C. for 5-20 seconds (rapid thermal anneal)." '202 patent, 24:17-20. Ixys seizes upon this specification language and attempts to construct claim limitations from it, despite the fact that not only is this language almost surely a preferred embodiment (which cannot be read into the claims), see Intervet, 887 F.2d at 1053, but it is *explicitly non-exclusive*, since it contains the signal "e.g." Ixys might be able to construct an argument that the "e.g." is denominating one of the "higher temperatures" at

which Pt may be diffused, and that therefore the parenthetical "(rapid thermal anneal)" is in fact defining this process, but they have not attempted to do so—the lack of any justification for such a brazen disregard for the typical canons of claim construction is one of the most striking aspects of this section of Ixys' brief.

Regardless, this limitation cannot possibly be valid. First, it refers only to platinum, while the claims in no way limit the scope of possible metals. Second, if the temperature range is to be read into the claims as a limitation there is no reason to believe that the temporal range should not similarly be included; however, to do so would render Claims 4 and 5 redundant in violation of the principle of presumed claim differentiation. See, e.g., Karlin Tech., Inc. v. Surgical Dynamics, Inc., 177 F.3d 968, 971-72 (Fed. Cir. 1999). APT's proposal to read the 1 minute limitation from Claim 5 into the definition of "rapid thermal anneal" is similarly wrong-headed. See id. at 972 ("limitations stated in dependent claims are not to be read into the independent claim from which they depend").

By contrast, APT proposes that a rapid thermal anneal process be construed to involve a system "able to handle very short thermal cycles over very large thermal excursions," without giving any indication of what a "cycle" or "excursion" is in this context (neither term is used in either the claims or the specifications) or trying to define "very short" or "very large" in any meaningful manner. If ever there were ever a moment to employ a modicum of that much-maligned "extrinsic evidence," this is it. However, APT writes that "What is important is that the system that implements the process be capable of short thermal cycles over large thermal excursions, such that the metal dopant profile can be created in a short time at that temperature and immediately frozen in the substance." without any citation whatsoever.

This places the court essentially in the position of guessing at the meaning of this term, or of defining it broadly and unspecifically (as APT seems to request). Since Ixys has given this court no cognizable reason to deviate substantially from APT's generalized construction, the court construes this claim term to mean: **"A process that employs high temperatures for short periods of time."**

CONCLUSION

For the foregoing reasons, the court construes the disputed claims in the manner described above.

/s/
Dated: January 22, 2004 MARILYN HALL PATEL
Chief Judge, United States District Court

1. The background facts are taken from the parties' moving papers, unless otherwise noted.

2. Indeed, most power MOSFETs are designed such that all of the transistors placed on a substrate share a common drain.

3. Since this court has already determined that the term "overlying" does not imply a requirement of electrical contact, APT cannot now bootstrap this requirement onto that language.

4. A moderate amount of discussion took place during oral argument regarding whether the word "typically" in the sentence at issue here ("Applicant asserts such metal layer other than metal silicide as taught by Korman et al. cannot be aluminum because the claimed metallization layer comprising aluminum is typically deposited overlying a top surface of a semiconductor often over portions of silicon oxide, and then masked and etched to form the desired patterns.") is meant to refer only to the clause that immediately succeeds it ("deposited overlying a top surface of a semiconductor...") or to the entire phrase, including the reference to masking and etching. This is a linguistic dilemma without a clear answer, but that fact is itself dispositive—the line in question does not represent an *unambiguous* disclaimer of claim scope.

5. APT also argues that it is physically impossible to diffuse transition metal throughout an entire substrate using a rapid thermal anneal process. See APT's Opening Br., at 12. Since claims are to be construed as they would be understood by an individual skilled in the art, there is certainly good reason not to read a claim to

create a physical impossibility. However, APT cites to know scientific authority, intrinsic or extrinsic, for this proposition, and thus the court will not consider it further.

6. Interestingly, in the section of its brief discussed here, APT cites to the same portion of the specifications that it employs in its argument regarding the construction of this claim language.

7. The specifications refer to "the best effect" and "This doping profile," implying straightforwardly that this is only one of many potential profiles that may be achieved through different tailoring algorithms. '202 patent, 24:11-12.